

WHAT IS CLAIMED IS:

1. A countercurrent chromatography apparatus comprising:
a plurality of plates, wherein at least one of said plurality of plates comprises at least first and second interleaved spiral flow channels formed therein, wherein each of said spiral flow channels includes a first end and a second end, wherein said first ends are closer to a central axis of said plate than said second ends, and wherein the second end of said first spiral flow channel is in fluid communication with the first end of the second spiral flow channel.
2. The apparatus of Claim 1, additionally comprising a plurality of septa positioned between pairs of said plates, wherein at least some of said plurality of septa comprise a hole which is positioned to establish a fluid connection between a second end of a spiral flow channel in one of said plurality of plates and a first end of a spiral flow channel in a second of said plurality of plates.
3. The apparatus of Claim 1, additionally comprising upper and lower plates, and wherein at least one of said upper plate and said lower plate comprises a gear.
4. A plate for use in countercurrent chromatography comprising:
a first surface;
a second opposed surface;
a plurality of interleaved spiral flow channels, each having an inner end and an outer end; and
at least one flow path connecting an outer end of at least one of said spiral flow channels to an inner end of a different one of said interleaved spiral flow channels.
5. The plate of Claim 4, wherein said flow channels comprise grooves formed in said first surface.
6. The plate of Claim 5, wherein said flow path comprises a groove formed in said second surface.
7. The plate of Claim 6, wherein said groove is substantially linear.
8. The plate of Claim 4, wherein said plurality of spiral flow channels have a substantially rectangular cross section.

9. The plate of Claim 5, comprising four interleaved spiral grooves in said first surface.

10. The plate of Claim 6, comprising four interleaved spiral grooves in said first surface and four radially extending grooves in said second surface.

11. A countercurrent chromatography apparatus comprising a column assembly, wherein the column assembly comprises a plurality of coupled separation disks, and wherein each of said separation disks comprises at least two interleaved spiral flow channels.

12. The apparatus of Claim 11, wherein outer ends of each spiral flow channel are in fluid communication with inner ends of different spiral flow channels.

13. A method of performing countercurrent chromatography comprising:

providing a test sample;

introducing said sample into a column assembly comprising:

an upper flange having a gear;

a lower flange;

a plurality of adjacent separation disks disposed between said upper and said lower flanges, wherein each of said plurality of separation disks comprises at least one spiral flow channel having a first end and a second end, and wherein the second end of the at least one spiral flow channel of one of said plurality of separation disks is in fluid communication with the first end of the spiral flow channel of another of said plurality of separation disks; and

a plurality of septa positioned between separation disks, wherein said plurality of septa comprise a hole positioned such that fluid can travel from the second end of the spiral flow channel of one of said plurality of separation disks through said hole of said plurality of septa to the first end of the spiral flow channel of another of said plurality of separation disks;

rotating said column assembly about an axis, whereby said rotation causes said sample to pass through said at least one spiral channel of said plurality of interleaving separation disks; and

eluting fluid from said column.

14. A method of manufacturing a column assembly for use in high speed countercurrent chromatography comprising:

(a) grooving a first spiral channel having a first end and a second end into a first surface of a disk;

(b) grooving at least a second spiral grooved channel interleaved with said first spiral channel and having a first end and a second end into the first surface of a disk;

(c) connecting the second end of the first spiral grooved channel with a radial flow channel on a second surface of the disk; wherein said radial flow channel is in fluid communication with the first end of said second spiral grooved channel on the first surface of said disk;

(d) coupling a plurality of disks formed according to steps (a), (b), and (c) via septa that comprise at least one hole.

15. The method of Claim 14, wherein said disk is formed from plastic.

16. The method of Claim 15, wherein said plastic is high density polyethylene.

17. The method of Claim 14, wherein said disk is stainless steel.

18. A method of performing chromatography, said method comprising:

routing fluid in a first groove from an inner end to an outer end of a first spiral flow path;

routing said fluid in a second groove from said outer end of said first spiral flow path to an inner end of a third groove; and

routing fluid in said third groove from an inner end to an outer end of a second spiral flow path.

19. The method of Claim 18, wherein said second groove extends substantially linearly.

20. A countercurrent chromatography apparatus comprising:

a series of coupled plates;

groove means in said plates for routing fluid through a plurality of spiral flow paths.

21. The apparatus of Claim 20, wherein said groove means is provided on first and second sides of at least one of said plates.

22. A method of performing sample separation comprising:

introducing a sample into a a column assembly, wherein the column assembly comprises a plurality of coupled separation disks, and wherein each of said separation disks comprises at least two interleaved spiral flow channels; and rotating said column assembly.

23. The method of Claim 22, wherein sad rotating comprises rotating in a synchronous planetary rotation.

24. The method of Claim 22, wherein sad rotating comprises mounting said column assembly on a rotating horizontal shaft.